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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004901038 for a patent by POLY COAT PTY LTD as filed on 02 March 2004.



WITNESS my hand this
Sixth day of April 2005

A handwritten signature in dark ink, appearing to read 'J. R. + C.'.

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Regulation 3.2

AUSTRALIA

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PROVISIONAL SPECIFICATION

Invention Title: "PAINTABLE PRIMER SYSTEM AND
METHOD OF USE"

The invention is described in the following statement:

TITLE

PAINTABLE PRIMER SYSTEM AND METHOD OF USE

FIELD OF THE INVENTION

5 The present invention relates to a paintable primer system suitable for applying to a thermoplastic polyolefin surface, without being limited thereto. In particular the invention relates to a paintable primer system suitable for applying to a polyethylene surface.

BACKGROUND OF THE INVENTION

10 Thermoplastic polyolefins (TPO's) such as polyethylene, polypropylene (PP), polystyrene (PS), thermoplastic elastomer (TPE) or ethylene-propylene rubbers have steadily grown in use as a material of construction for a large array of consumer goods. In particular, polyethylene (PE) is used in the manufacture of toys, containers, packing films, household appliances, and in particular, the automotive industry as it is relatively inert, flexible, impermeable to water
15 vapour, light weight, durability and is produced at a relatively low cost.

However as PE is nonpolar, it is reluctant to accept a paint or decorative print coating. Most paints are polar, and thus require a surface with some degree of surface polarity on which it is being applied before they can adhere to it with any degree of desirable adherence. This problem has been addressed with limited
20 success.

One approach to enhancing the paintability of a TPO surface or substrate is to subject it to physical or chemical etching. For example, the outside surface of PE water tanks are either lightly sanded or flame treated to remove the waxy, glossy surface prior to painting. Alternatively, the TPO surface or substrate may

be irradiated with a plasma. A variation to this method is taught in JP59114039A2, whereby a primer is applied to a non-vulcanised rubber substrate and dried prior to irradiation. While generally effective, these methods are complex in nature and are more difficult to control in terms of quality and consistency across the surface. In addition, these techniques are generally more expensive than other alternatives.

Another approach is to apply several primer coats to a TPO substrate. While such primers are generally recognized as effective over short durations, they are expensive and their application is an extra step in the finishing of the manufactured TPO article. In addition, primer systems require multiple coats and still lack sufficient bonding strength to maintain adherence to the TPO substrate over time. Known primer compositions are unable to achieve satisfactory adhesion, resulting in peeling or chipping of the primer and/or covering paint over time.

As primers have had limited success, more recent techniques have been to modify the physical and/or chemical properties of the TPO *per se* (eg. as taught in WO 9325617). This can be achieved either by blending the thermoplastic polyolefin with other thermoplastic polymers, or by grafting functionalised groups to one or more polar groups along the polymeric backbone. While this approach has been successful, it is complex and can only be applied to existing substrates at the time of manufacture.

OBJECT OF THE INVENTION

Accordingly, it is an object of the invention to provide a paintable primer system suitable for applying to thermoplastic surfaces which overcomes or

alleviates one or more of the problems of the prior art or provide a useful commercial alternative.

SUMMARY OF THE INVENTION

Until now, known primer compositions have achieved only partial and/or
5 extremely short term paint adhesion to thermoplastic polyolefins, in particular, PE substrates. The present invention is predicated upon a novel paintable primer system with adhesion suitable for use on various thermoplastic polyolefins, inclusive of PE.

According to a first aspect of the present invention there is provided a
10 dispersion comprising:

- a metal carbonate;
- an alkaline earth metal salt of a C₉-C₂₀ aliphatic fatty acid;
- a thermoplastic polymer based on cellulose;
- an acrylic polymer based on ethyl methacrylate;
- 15 a phthalate ester of a C₁-C₆ alkyl aromatic alcohol
- a surfactant; and
- a C₁-C₆ ketone.

The dispersion may further comprise one or more of the following:

- a white metal oxide pigment; and
- 20 a C₁-C₆ aliphatic primary alcohol.

According to a second aspect of the invention, there is provided a method of formulating a dispersion, said method including the steps of:

mixing components of said dispersion according to the first aspect; and

processing said components of said dispersion by dry grinding through one or more mill rolls so as to obtain said composition in the form of solid dry sheeting.

5 Preferably, said method includes the step of pre-blending at least a portion of said composition prior to grinding through said one or more mill rolls.

According to a third aspect of the invention, there is provided a primer comprising:

- a dispersion as described in the first aspect;
- an C_1-C_6 aliphatic alcohol;
- 10 a phthalate based on an ester of a short chain alkyl aromatic alcohol;
- an acrylic polymeric resin based on ethyl methacrylate;
- a C_1-C_6 ester;
- a C_1-C_6 ketone;
- a metal carbonate; and
- 15 a thermoplastic polymer based on cellulose.

Preferably, said primer may further comprise one or more of the following:

- a white metal oxide pigment;
- a halogenated polyolefin;
- 20 an aromatic hydrocarbon; and
- a Smectite clay mineral.

Preferably, said C_1-C_6 ketone is a butanone.

According to a fourth aspect of the invention, there is provided a method of preparing a thermoplastic polyolefin substrate for painting including the step of:

5 applying an adhesive promoter to said thermoplastic polyolefin substrate;
and

 sequentially applying said primer of the third aspect to said thermoplastic polyolefin substrate.

 Preferably, said thermoplastic polyolefin substrate may be selected from polyethylene, polypropylene or other plastics.

10 According to a fifth aspect of the invention, there is provided a method of preparing a thermoplastic polyolefin substrate for painting including the step of applying said primer of the third aspect to said thermoplastic polyolefin substrate.

 Preferably, said thermoplastic polyolefin substrate may be selected from polypropylene or other plastics.

15 The adhesive promoter preferably comprises:

 an aromatic hydrocarbon;
 co-polymers of lower C₂-C₆ alkenes with vinyl esters; and
 a chlorinated polyolefin.

 Preferably, said substrate includes polypropylene or other plastics.

20 As used herein, "*paint*", "*painting*" and "*painted*" is meant a coat, covering or decoration using a liquid mixture, usually containing a solid pigment in a liquid vehicle and is used as a decorative or protective coating and that which forms a thin dry film when applied to a surface.

As used herein, "low molecular weight" is meant the sum of the atomic weights (International Atomic Weights) of the atoms in the molecule of up to 250 grams/mole.

DETAILED DESCRIPTION

5 The present invention resides in a novel paintable primer system which binds to PE surfaces with high bonding strength. Advantageously, application of an adhesion promoter followed by a primer containing one or more dispersions is suitable for application to PE, PP and other plastic substrates. The primer may be applied to PP and other plastic substrates without the need for the adhesion
10 promoter whilst still providing suitable adhesion.

The invention provides one or more dispersions or solid dispersion "chips". It will be appreciated that in formulating either a first 180/9101 or second 180/9020 chip, a number of substituted agents may be used.

General dispersion or 'chip' formulation

15 Metal carbonates are preferably selected from alkaline earth metal carbonates. Preferably, calcium carbonate is used and suitable commercially available calcium carbonates such as Hakuenka CC may be used.

Alkaline earth metal salts of C₉-C₂₀ aliphatic fatty acids may be used in the formulation. Suitable salts are selected from stearates or other octadecanoic acids
20 of alkaline earth metals. Preferably, the stearate is a calcium salt.

Thermoplastic polymers based on cellulose may be selected from cellulose acetate, cellulose propionate and cellulose acetate butyrate. The thermoplastic polymer based on cellulose is a cellulose acetate butyrate. The cellulose acetate butyrate is preferably the commercially available CAB 381-2 polymer.

The acrylic polymer based on ethyl methacrylate may be any such acrylic polymer based on ethyl methacrylate. More suitably, the commercially available acrylic polymer Plexigum N743 is used.

5 The phthalate ester of C_1 - C_6 alkyl aromatic alcohols is preferably butyl benzyl phthalate. Suitable commercially available butyl benzyl phthalates include Sanitizier 160.

A variety of surfactants may be used. The surfactant may be cationic, anionic or non-ionic. Preferably the surfactant is a cationic surfactant such as an amino derivative of glycerol esters of long chain fatty acids. Suitably, the surfactant
10 includes tallowpropane diamine dioleate.

Solvents selected from low molecular weight (C_1 - C_6) ketones based on propanones, butanones and pentanones may be used. Suitably, the ketone selected from is methyl iso butyl ketone and methyl ethyl ketone. Preferably, the ketone is methyl ethyl ketone.

15 *First Dispersion Formulation (180/9101)*

Preferably, calcium carbonate is present between 18 and 12 parts per weight of the dispersion. More preferably, calcium carbonate is present between 16 and 13 parts per weight and most preferably, between 15.5 and 14 parts per weight of the dispersion.

20 If desired, white metal oxide pigments may take the form of any white metal oxides, eg. oxides and dioxides of zinc, manganese and aluminium and white "d-block" metal dioxides. Suitable metal dioxides include titanium dioxide such as the commercially available White RCL 575. Preferably, titanium dioxide is present between 7.8 and 4.7 parts per weight of the dispersion. More preferably,

titanium dioxide is present between 7.2 and 5.3 parts per weight and even more preferably between 6.8 and 5.8 parts per weight of the dispersion.

Suitably, calcium stearate is present between 0.5 and 0.3 parts per weight of the dispersion and more suitably, is present at approximately 0.4 parts per weight of the dispersion.

The thermoplastic polymer based on cellulose, cellulose acetate butyrate, is present between 2.6 and 1.6 parts per weight of the dispersion and more preferably, between 2.4 and 1.8 parts per weight. Still more preferably, the thermoplastic polymer is present between 2.2 and 2 parts per weight of the dispersion and preferably still, is present at 2.1 parts per weight of the dispersion.

The acrylic polymer based on ethyl methacrylate is present between 2.6 and 1.6 parts per weight of the dispersion. Preferably, the acrylic polymer is present between 2.4 and 1.8 parts per weight and more preferably, between 2.2 and 2 parts per weight of the dispersion. Preferably still, the acrylic polymer is present at 2.1 parts per weight of the dispersion.

The phthalate ester used, eg. butyl benzyl phthalate, is present between 1.2 and 0.6 parts per weight of the dispersion. More preferably, the phthalate is present between 1.0 and 0.8 parts per weight and even more preferably, is present at 3 parts per weight of the dispersion.

The surfactant, eg. tallowpropane diamine dioleate, is present between 0.3 and 0.1 parts per weight of the dispersion. More preferably, is present at 0.2 parts per weight of the dispersion.

The ketone, eg. methyl ethyl ketone, is present between 3.7 and 2 parts per weight of the dispersion. Preferably, the ketone is present between 3.2 and 2.4

parts per weight and even more preferably, between 3.0 and 2.6 parts per weight of the dispersion. Still more preferably, the ketone is present at 2.8 parts per weight of the dispersion.

Second Dispersion Formulation (180/9020)

- 5 The white metal oxide pigment, *eg.* titanium dioxide may be optionally present between 29 to 20 parts per weight of the dispersion. Preferably, the dioxide is present between 28 to 22 parts per weight and more preferably, between 26 to 24 parts per weight of the dispersion. Still preferably, the dioxide is present at 25 parts per weight of the dispersion.
- 10 The thermoplastic polymer, *eg.* cellulose acetate butyrate is present between 8.1 and 4.9 parts per weight of the dispersion and more preferably, between 7.5 and 5.5 parts per weight of the dispersion. Even more preferably, the thermoplastic polymer is present between 6.8 and 6 parts per weight chip and still preferably, is present at 6.5 parts per weight of the dispersion.
- 15 The phthalate esters used, *eg.* butyl benzyl phthalate is present between 2.0 and 1.2 parts per weight of the dispersion and more preferably, between 1.8 and 1.4 parts per weight of the dispersion. Even more preferably, the phthalate is present between 1.7 and 1.5 parts per weight of the dispersion and still more preferably, is present at 1.6 parts per weight of the dispersion.
- 20 The surfactant, *eg.* tallowpropane diamine dioleate is present between 0.3 and 0.2 parts per weight of the dispersion. More preferably, tallowpropane diamine dioleate is present between 0.2 and 0.1 parts per weight and even more preferably, is present at 0.25 parts per weight of the dispersion.

The ketone, eg. methyl ethyl ketone is present between 0.8 and 0.4 parts per weight of the dispersion. More suitably, the ketone is present between 0.7 and 0.5 parts per weight of the dispersion and even more suitably, is present between 0.65 and 0.55 parts per weight of the dispersion. Still more suitably, the ketone is present at 0.6 parts per weight of the dispersion.

Alcohols in the form of C_1 - C_6 aliphatic primary alcohols are used. Suitable alcohols include methanol, ethanol, propanol, isopropanol and isobutyl alcohols. Suitably, the primary alcohol is isopropyl alcohol. Preferably, the primary alcohol is present between 1.6 and 0.8 parts per weight of the dispersion and more preferably, between 1.4 and 1 parts per weight of the dispersion. Even more preferably, the primary alcohol is present between 1.3 and 1.1 parts per weight of the dispersion and still preferably, is present at 1.2 parts per weight of the dispersion.

Preferably also, ethanol is present between 2.6 and 1.4 parts per weight of the dispersion. Still preferably, ethanol is present between 2.3 and 1.7 parts per weight of the dispersion and even more preferably, between 2.2 and 1.9 parts per weight of the dispersion. Preferably still, alcohol is present at 2 parts per weight of the dispersion.

Primer

A 'Bentone' solution is optionally used as a suspending liquid or vehicle of the remaining primer components. In the 'Bentone' solution, aromatic hydrocarbons may be selected from xylol and toluol. Preferably, xylol is present between 38 and 31 % of the primer. More preferably, xylol is present between 36.2 and 32.8 % and even more preferably, is present at 34.5 % of the primer.

Clay mineral tetraalkyl ammonium hectorite or other suites of clay minerals such as straight (non-branched) hectorite from the Smectite group of minerals may be used in the 'Bentone' solution, eg. Montmorillonite, Laponites). A suitable hectorite may be the commercially available 'Bentone 28'. Preferably, the tetraalkyl ammonium hectorite is present between 0.8 and 0.3 % of the primer and more preferably, between 0.7 and 0.4 % and still more preferably, between 0.6 and 0.5 % of the primer. Preferably still, the tetraalkyl ammonium hectorite is present at 0.5 % of the primer.

Suitably, C₁-C₆ aliphatic alcohols used in the formulation may be selected from methanol, ethanol, propanol, isopropanol and isobutyl alcohols, spirits such as methylated spirit or ethyl alcohol. Preferably, the alcohol is present between 6.3 and 3.9 % of the primer and more preferably, between 5.9 and 4.6 % of the primer. Even more preferably, the alcohol is present at 5.2 % of the primer.

Phthalate esters based on esters of short chain alkyl aromatic alcohols are used in the primer. Preferably, the butyl benzyl phthalate is present between 1.1 and 0.35 % of the primer. More preferably, the phthalate is present 0.9 and 0.5 %, and more preferably between 0.8 and 0.6 % of the primer. Even more preferably the phthalate is present at 0.7 % of the primer.

Any acrylic polymer based on ethyl methacrylate may be used in the primer. Suitable polymers may be selected from the Paraloid and Plexigum family of resins and the commercially available Paraloid B72 and Plexigum N743 or N742 are suitable. Preferably, the acrylic polymeric resin is present between 10.6 and 7 % of the primer, and more preferably, between 9.7 and 8 %. Preferably still, the

resin is present between 9.3 and 8.4 %, and even more preferably, the resin is present at 8.8 % of the primer.

5 C_1 - C_6 esters, eg. those based on methyl, ethyl, propyl and butyl chains are suitable in the formulation. Also suitable are low molecular weight acetates such as diethylether, ethyl acetate. Suitably, the ester is *n*-butyl acetate. Preferably, the *n*-butyl acetate is present between 24.1 and 16 % in the primer. More preferably, *n*-butyl acetate is present between 22 and 18 % and even more preferably, between 21 and 19 %. Preferably still, *n*-butyl acetate is present at 20 % of the primer.

10 The primer preferably includes two C_1 - C_6 ketones selected from propanones, butanones and pentanones. Suitably, the ketone is based on a butanone. More suitably, the ketone is methyl iso butyl ketone and methyl ethyl ketone. Preferably, methyl ethyl ketone used and is present between 18 and 12 % of the primer and more preferably, between 16 and 13.5 % of the primer. Still
15 more preferably, the ketone is present between 15.8 and 14 % and is most preferably, present at 15 % of the primer.

Suitably also, methyl iso butyl ketone is present between 7.5 and 2.5 % of the primer and more preferably, between 6 and 3.5 % of the primer. Still more preferably, methyl iso butyl ketone is present at 5 % of the primer.

20 Halogenated polyolefins used in the formulation may be selected from polyolefins containing various percentages of xylene as solids. Suitable halogenated polyolefins include the chlorinated polyolefin 343-3 (50 % solids in xylene) and chlorinated polyolefin 153-2 (25 % solids in xylene). Suitably, the chlorinated polyolefin (CP) is the commercially available chlorinated polyolefin

343-3. Preferably, the CP is present between 1.5 and 0.5 % of the primer and more preferably, between 1.12 and 0.8 %. Preferably still, the CP is present at 1%.

Adhesive promoter

5 The adhesive promoter may be formulated from a group selected from most alkyl aromatic hydrocarbons or aromatic hydrocarbons eg. toluol or xylol. Preferably, either toluol or xylol is present between 3.3 and 1.8 % of the adhesive promoter. More preferably, either toluol or xylol is present between 3.2 and 2.0 %.

10 Still preferably, either toluol or xylol is present at 2.5 % of the promoter formulation.

 Co-polymers of lower C₂-C₆ alkenes with vinyl esters such as ethylene vinyl acetate are used in the formulation. Suitable co-polymers of lower chain alkenes with vinyl esters include Elvax 260. Preferably, the copolymer of ethylene and vinyl acetate is present between 11.3 and 3.8 % of the adhesive promoter. More

15 preferably, the co-polymer is present between 9.4 and 5.6 % and even more preferably, between 8.3 and 6.8 % of the adhesive promoter. Still preferably, the co-polymer is present at 7.5 %.

 The chlorinated polyolefin (CP's) used is the commercially available chlorinated polyolefin 153-2 (25% in xylene). Preferably, the CP is present

20 between 37.5 and 12.5 % of the adhesion promoter and more preferably, between 31 and 18.8 % and even more preferably, between 27.5 and 22.5 % the adhesion promoter. Still preferably, the CP is present at 25 %.

 So that the invention can be understood in more detail, the skilled person is referred to the following non-limiting preferred embodiments.

EXAMPLES

The paintable primer system of the invention comprises an adhesion promoter and a primer containing one or more dispersions or 'chips'.

EXAMPLE 1

Dispersion Compositions

First Dispersion ('180/9101 Chip')

Constituents	Trade Names	parts by weight	Range +/-
Calcium Carbonate (Synthetic)	Hakuenka CC	14.8	15 %
Titanium Dioxide	White RCL 575	6.3	25 %
Calcium Stearate	Calcium Stearate	0.4	20 %
Cellulose Acetate Butyrate	CAB 381-2	2.1	25 %
Acrylic Polymer	Plexigum N743	2.1	25 %
Butyl Benzyl Phthalate	Saniticizer 160	0.9	25 %
Liquid 180/9101 Mix		3.0	
Tallow Diamine Dioleate	0.2		25 %
Methyl ethyl ketone	2.8		30 %

Second Dispersion ('180/9020 Chip')

Constituents	Trade Names	parts by weight	Range +/-
Titanium Dioxide	Tiona RCL 575	25.00	15 %
Cellulose Acetate Butyrate	CAB 381-2	6.50	25 %
Butyl Benzyl Phthalate	Saniticizer 160	1.60	25 %
180/9020 Liquid		4.05	
Tallow Diamine Dioleate	0.25		25 %
Ethanol	2.0		30 %
Methyl ethyl ketone	0.6		30 %
Isopropyl alcohol	1.2		30 %

EXAMPLE 2

Dry grinding process of the dispersion

The dispersion compositions of Example 1 are produced by the following method. Calcium carbonate, titanium dioxide and calcium stearate are blended

into a first vessel. The mixture is wet down with the respective 'Liquid Mixes' or solvents so as to coat the pigment particles prior to milling.

5 In a second vessel, one or more powdered resin(s) and butyl benzyl phthalate are blended together. In formulating the first dispersion, the cellulose acetate butyrate and the acrylic polymer resins are used, whereas the cellulose acetate butyrate resin (only) is used in the second dispersion.

10 The above premixed compositions are put onto the mill for blending together. The resultant mix of both vessels forms a plasticine type material. This material is taken off the mill in sheet form and cut into small portions, e.g. 160 mm x 250 mm. The mill rolls are then completed closed or nipped tightly and the cut sheets are put into the mill. The pre-cut pieces form a thin sheet that is continuously cut off and put back through the nip. The materials are continually ground until all the solvent is driven off, leaving a dry sheet to be taken off the mill. This sheet is then granulated to form a "chip" ready for use in manufacturing
15 the primer.

While using a white pigment, eg. titanium dioxide in the first dispersion agent is preferred, it is not essential as the second dispersion may also contain a white pigment. Specifically, the white pigment may be optionally and wholly present in a second dispersion to provide a white tinted opaque finish if desired.

20 Alternative to using both a first and second dispersion in a primer, a first dispersion may be used alone, provided an equimolar amount of the cellulose acetate butyrate resin component from the second dispersion is added to the first dispersion formulation.

Advantageously, this novel method of dry grinding to form the dispersion effectively disperses resins and other materials that are otherwise difficult to blend to a fineness state and grinds all the ingredients to result in a solid form. This process provides a high quality lay and flow of the finished primer.

5 To compare the effectiveness of the traditional bead mill method with that of the dry mill process outlined above, the entire primer containing one or more ingredients was passed through both the traditional bead mill method and the dry mill process. Each primer was sprayed onto a bumper bar. The adhesion achieved by the primer using the traditional bead mill method was similar to that using the
10 dry mill process. However, the primer using the bead mill method showed inferior dispersion and the composition was highly textured and rough. The primer sandpaper finish was found unsuitable for the subsequent application of spray paint. In contrast, the primer produced by the dry mill method dispersed evenly and produced a glass-like finish that could be painted immediately.

15 The above dry grinding process is contrasted to conventional liquid dispersion 'mill grind' liquid dispersion methods used in other formulations. In this process, the components are dissolved in solvents and plasticisers and the mixture is then passed through a cylinder containing porcelain beads which continuously collide against each another and the material within the vessel. The
20 frictional bead mill action acts to disperse the components within the mixture. However, the degree of component dispersion in the conventional method is lower as compared to that of the present inventors novel dry mill method.

It may be appreciated by a skilled person that the dispersions may be alternatively produced by the conventional methods of liquid dispersion methods as described above, as well as known extrusion techniques.

EXAMPLE 3

5 *Polyethylene Adhesion Promoter Composition*

Toluol (50.0%) is heated (65 –70 °C) in a water jacket under dry conditions. The solution is left to stand (10 to 15 min), to which is then added resin Elvax 260 (2.5 %) with continuous mixing. Once complete solubility is obtained, the mixture is readjusted (by weight) to make up any lost toluol. A
10 mixture of toluol (7.5 %) and xylol (25 %) is then added. To the cooled mixture is added chlorinated polyolefin CP 153-2 (25 % in xylene) (15.0 %) and stirred.

EXAMPLE 4

Primer Composition

Bentone Solution

15 Tetraalkyl ammonium hectorite 'Bentone 38' (0.6 kg, 0.22 %) is slowly added to xylol (2.4 kg, 1.9 %) and blended (2 min). The remaining xylol (2.3 kg, 1.9 %) is then added and the mixture stirred. To this is added methylated spirits (0.2 kg, 0.1 %). The Bentone solution is then added to the reaction vessel.

20 To the reaction vessel, each of the following is added to a continuously stirred mixture:

isopropyl alcohol (1.0 kg)

butyl benzyl phthalate (Santicizer 160) (0.14 kg)

butyl acetate (7.0 kg)

methyl iso butyl ketone (2.0 kg)

methyl ethyl ketone (3.0 kg)

acrylic polymer based on ethyl methacrylate (Plexigum N742) (6.9 kg)

To the above solution, both the 180/9101 chip (16.0 kg) and 180/9020 chip (0.4 kg) as described above are slowly added to the above mixture and a
5 thickened mixture is maintained.

To the thickened mixture is added the following:

n-butyl acetate (13.0 kg)

isopropyl alcohol (4.0 kg)

methyl iso butyl ketone (4.0 kg)

10 methyl ethyl ketone (6.0 kg)

toluol (6.0 kg).

To this mixture is added a chlorinated polyolefin eg. CP 343-3 (2.0 kg) in xylol:toluol (4.7 kg: 10.0 kg). The vessel containing the chlorinated polyolefin mixture is washed with toluol (8.4 kg) and the toluol washing is added to the
15 above mixture.

The present invention provides for a paintable primer system suitable for applying to various surfaces. For example, application of both the adhesion promoter followed by the primer is suitable for application to PE substrates.

Alternatively, the primer may be applied (alone) to PP and other plastic
20 substrates without the need for the adhesion promoter and still provide high adhesion to the substrate. Advantageously, the primer is flexible and is able to be tinted. In this way, the tinting assists the spray painter by permitting less topcoat paint required due to the coverage of the primer.

EXAMPLE 5*Method of use*

The adhesion promoter is shaken and strained prior to application. The polyolefin surface, eg. PE is wiped thoroughly with a cleaning solvent or thinners, eg. acetone or acrylic thinners. The cleaning solvent or thinners are flashed off or removed with a clean cloth. Two medium wet coats of the adhesion promoter are applied, allowing 60 seconds flash off between each adhesion promoter coat. The polyolefin surface is heated, preferably by baking (eg. 45 min, 45° C). Although this baking or 'curing' step is not essential, it is preferred as it accelerates a cross linking effect of the adhesive promoter to the polyolefin surface. The polyolefin surface is cooled to room temperature.

The primer containing one or more solid dispersions or 'chips' is shaken (ca. 30 seconds), strained and 1 or 2 medium primer coats applied, allowing one minute flash off time between each application. If desired, a longer period (eg. 10 minutes) to dry before scuffing or sanding prior to painting to achieve a higher finish may be used. The polyolefin is now suitably prepared for painting with a top coat. Suitable top coats are selected from coloured tint or paint, antifouling paint agents or other top coats, eg. acrylics, two-pack polyurethanes, polyesters or cellulose based resins.

EXAMPLE 6*Adhesion performance evaluations*

The crosshatch and tape peel test of ASTM D3359-87 was used to determine paint adhesion to a PE substrate. This test involves cutting the painted substrate with a sharp bladed instrument (eg. razor blade). Vertical (eg. 10) and

horizontal lines (eg. 10) are cut, resulting in 100 – 2 mm squares or boxes, patterned by the cutting. Threaded adhesive tape is adhered to the cut portions and the blunt edge of the blade is rubbed over the tape insuring that the tape totally adheres to all the formed boxes. The tape is removed with a quick motion. The number of boxes removed by the tape determines the level of adhesion. A 5% loss is acceptable and can be classified as total adhesion. Tests using the adhesion promoter and primer applied to PE substrates showed a 3% and 0 % loss after 24 and 48 hours respectively.

Accelerated Weather Tests

Accelerated Weather Tests were completed on a test PE substrate using standard testing methodologies (Architectural & Industrial Coatings, Penrith, Australia). In the tests, 500 hours equated to 4 years of weathering to assess deterioration in adhesion loss caused by weathering. The tests showed that the adhesion of the primer to the PE had not been affected by the test weathering process.

The cross-hatch method was performed and showed zero loss of adhesion after 5 years of accelerated weathering.

Field testing

Experimental field testing was performed on PE truck bull bars travelling continuously across a hostile environment, i.e. the Nullabor Desert. These trucks have sustained multiple impacts with wild fauna, eg. kangaroos, road side posts and various airborne objects, eg. stone chips. Analysis of the paint integrity showed no observable paint flaking on or around impacted areas.

Advantageously, the paintable primer system of the present invention may be applied to existing PE substrates and need not be incorporated at the time of article manufacturing, *i.e.* it may be applied to existing goods.

Application of the present paintable primer system may be found in
5 various fields.

The paintable primer system is suitable for application to PE substrates in the form of water buoys, boats, exterior shells of concept cars and automotive parts such as bull bars, bumper bars, non-metallic 'smart bars' and any plastic components of semi-trailers, horse floats and similar vehicles, inclusive of the
10 side mirrors.

Further application of the paintable primer system may also be found in other manufactured PE devices, such as marketing or exhibition displays suitable for commercial and retail markets. Currently, such displays have colour introduced when the substrate is rotormoulded, however, the colouring is inferior
15 by way of smoothness or finish. Hence it is contemplated that such PE displays and the like may be painted using the present paintable primer system and provide an 'automotive' quality finish, thus enabling the company a stronger visual marketing advantage over any other.

Presently, the rapid growth of the algae requires continuous maintenance
20 by way of antifoul coating on objects such as vessels and water buoys which are continuously exposed to algae in marine environments. If this maintenance is not carried out, buoys become unbalanced, thereby reducing visibility and hence safety. Algal growth decreases the performance of speedboats and the like through surface drag.

Until now, PE water bouys and water vessels have been unable to be successfully coated with an antifouling agent due to poor adherence of either an antifoul coating or paint. Thus it may be readily apparent that the paintable primer system may be used to carry antifouling agents to objects such as boat hulls and
5 buoys. Further advantageously, waterway buoys may be painted to give them a brighter appearance than that obtained by conventional tint moulding to enhance safety.

It may be appreciated by the skilled person that the above composition may be varied according to accommodate various formulation conditions such as
10 temperature and humidity which may influence solubilities within the mixtures. It may also be appreciated that the present paintable primer system may be used to coat non plastic substrates such as gyprock, concrete, metals, ceramics.

It will be appreciated by the skilled person that the present invention is not limited to the embodiments described in detail herein, and that a variety of other
15 embodiments may be contemplated which are nevertheless consistent with the broad spirit and scope of the invention.

DATED this Second day of March 2004

Poly Coat Pty Ltd

By their Patent Attorneys

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